The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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Salvage

THE interesting discussion held by the Institution of Chemical Engineers and the Chemical Engineering Group on the subject of Salvage in the chemical industry reminds us that this subject is only a broader treatment of the basic problem of effluents and effluent disposal which is so often before every works manager. An effluent by the nature of things is liquid or gaseous; waste material may equally be solid. There seem to be three well-defined stages in the general operation of salvage. The first, and frequently the longest stage in point of view of time required for solution, is the realisation that there is something of possible value escaping from a factory or process. It is surprising how for years a given refuse may be dumped—on to a tip; into the air (*pace* the Alkali Inspectorate); into a sewer; or into more reprehensible places—without anyone realising that there is anything of value in it. If the works happens not to employ a chemist, stage one may never be passed. So many of the industries discussed by the Chemical Engineers were not strictly chemical industries that one is left with the belief that comparatively little of the salvageable material in the country is recognised as such. The Salvage Department of the Ministry of Supply will no doubt do great work in bringing these problems to the fore.

The second stage is one that appeals to the chemist; it is that of devising a process by which the usable material may be recovered from the discard. That may not be difficult, but on the other hand, it may be apparently insoluble.

This is a problem in chemical engineering that should not be beyond our powers to solve in many instances, but there are some commodities, such for example as peat and apparently materials used in leather manufacture, which years of effort has not permitted us to dry economically. The recovery of phenols from spent gas liquor is an instance of successful dehydration and so also is the manufacture of fertiliser and methane gas from sewage, a material which contains over 99 per cent. of water as received.

The third stage is frequently the most difficult of all. It is that of finding an economic basis which permits the use of the process discovered in the second stage. If the first stage has brought the conclusion that the recovered material may be of value, this stage will involve finding an outlet for it. That requires a very wide knowledge of other industrial processes in order that it may be realised that there is some other industry in which apparently unpromising materials can be used. It seems that in view of this very widespread difficulty, a clearing house of information would be of inestimable use, and this should be the function of the Salvage Department of the Ministry of Supply. It may be, of course, that the salvageable material is not of value in itself, but is costing more for its disposal than it would do if it were removed or treated on the works; generally this falls under the province of effluents, and is already being dealt with by the Water Pollution Research Board or the Alkali Inspector.

The problem of disposal of recovered material, together with the many difficulties which may crop up, some of which have been here outlined, prompts us to suggest that some permanence should be given to the Salvage Department of the Ministry of Supply after the war. Salvage in wartime is different from salvage in times of peace. The saving of shipping tonnage may outweigh costs of recovery in time of war. The whole business is severely regulated by economics in time of peace. Moreover, the necessary plant may be costly and, as Mr. J. Arthur Reavell pointed out, the solution of the problem may be costly and that solution may then be used by those who have contributed nothing towards it. Salvage of waste materials common to a whole industry is a typical problem for Government research to which the National Chemical Laboratory seems peculiarly fitted. After the war, we shall, as a nation, be impoverished and we shall not be able to import goods to the same extent as we have done in the past. There will be all the more need to utilise every scrap of whatever we have. Salvage problems may be different in wartime, but they will be equally important in peace.

A form of salvage that can be practised in many industries and, in one way or another, in most individual factories, is the prevention of waste. It is even better to use less of an article for a given purpose than to go to the expense of recovering the excess after the process has been completed. That is a matter for careful consideration by chemists and chemical engineers throughout the country. Another step—a long-term policy—would be the provision of central plants where the solid and possibly liquid excrement of whole industries could be treated. Here the cost of transport would be the dominant factor; this has been worked out in some detail for ammonia. To-day, ammonia is an excrement of the gas industry, often difficult of disposal and of little value to any but the large works. By the provision of central ammonia factories, much of the difficulty can be avoided. It all comes back, however, to this problem of dehydration, for water is expensive to carry and expensive to remove.

NOTES AND COMMENTS

The Season's Greetings

TO all engaged in the chemical and chemical industries THE CHEMICAL AGE conveys herewith the season's heartiest greetings and all good wishes for a year of prosperity in 1941. The chemical industries have shown themselves unrivalled in the national effort towards the expansion of export trade and fully deserve their share of any prosperity that can be won from the grim circumstances of the day. Courage and energy have been as much their watchwords as those of the fighting services, and their efforts to aid the nation's war effort will have gone far to lay a secure foundation for future strength in the better times of peace which we all hope lie not too far ahead. In accordance with annual practice, THE CHEMICAL AGE is publishing a review of the year; but to do full justice to the occasion, the date of the review has been postponed until January and a full consideration of progress in the various branches of the chemical industry, by distinguished authors, will be, as usual, its outstanding feature. It will be noted that, although war conditions naturally impose a check on certain developments, in other ways they actually foster other branches of research and advancement which normally might suffer from neglect. In any case, we feel that it is a good augury to start a year's work with its most important issue, as an indication of our confidence that 1941 will see the nation's resolution justified and the energy of its citizens rewarded.

Cement Manufacture

THE somewhat vexed question of cement production has at last been ventilated in the House of Commons, where Mr. Hicks, Parliamentary Secretary to the Ministry of Works and Buildings, made a fairly comprehensive statement of the psition on Thursday last week. As reported elsewhere in our pages, Mr. Hicks expressed a strong preference for the use of hæmatite slag, but it may be pointed out that this material, though probably the best, is far from being the only material available for turning out a reasonably good quality of cement. Lime, for example, mixed with granulated slag, produces quite a serviceable product. The use of blast-furnace slag, blended with Portland cement in the approximate ration of one part of slag to two parts of Portland cement, would raise the total quantity of cement produced by about fifty per cent., and it is to be hoped that the Committee, which is being empowered to inquire into the present methods of cement manufacture, will investigate other forms of slag-cement blending besides that with hæmatite slag. It is noteworthy that the recommendation for the establishment of the committee of inquiry came originally from Lord Wolmer, who is a past president of the Cement Manufacturers' Association.

Ring Out the Old!

GOOD riddance to 1940! What a year! The British Empire had black patches in 1899 and 1915, but never before in the memory of any still living so sombre an experience as that of 1940. Nobody who lived through the days following the capitulation of France will forget the intensity of his emotions. The stark spectre of invasion in the summer and the hideous nightmare of indiscriminate air raiding in the autumn have left an indelible mark on the war generation. Yet, to be fair to the departing year, its story is not entirely one of colossal disasters and vast disappointments. The year goes out not only with inspiring memories of heroic achievements, but with bright gleams of a better time. The now classic British exploit for which 1940 will be remembered has been the complete defeat by the Royal Air Force of the German attempt to dominate the skies of Great Britain. The military annals of the world contain no more magnificent chapter than the first phase of the Battle of Britain. The evacuation of the B.E.F. from the Dunkirk beaches was memorable in quite a different way. It was a masterly essay in retreat, whereas the repulse of the Luftwaffe was a positive contribution to a victorious offensive. Later still, the most heartening tonic has been afforded by successive hammer strokes at the Italians, first by the Greeks, whose confidence in British promises no less than in their own strong right arm should always be gratefully remembered, and by the doughty Imperial forces in Egypt. Presiding over all, too, is a Prime Minister who has led the nation more gloriously onward than any since the two Pitts, and it is to the eternal credit of Mr. Churchill that the new elements of speed and surprise have found the Government equal to every emergency.

Plastics in Industry

CONCEALING their identity under the collective pseudonym "Plastes," a group of writers have produced a timely volume on "Plastics in Industry," which has just been published by Chapman & Hall at 12s. 6d. We propose to review the book fully in a subsequent issue, but in the meantime the reasons for its publication give rise to subject for comment. Probably more ill-informed rubbish has been written about plastics in recent years than about any other branch of chemical industry, and it certainly is about time that a true picture of plastics was given to the world, and this is the authors' avowed aim. This is not the place to say whether they have succeeded or not, but the mere fact that an attempt has been made to present such a picture is worthy of note. Some journalist, the authors say in their foreword, has coined the phrase, the "Age of Plastics," for the present day. As well call it the "Age of Aspirin" because a large quantity of that drug is used. The main point is that plastics are, from their varied nature, suited to a vast variety of different purposes, and it is this suitability which is the prime consideration in their usage.

British Benzol Chairman's Speech

A REASONED plea for the alteration of the Excess Profits Tax was made by Major-General Sir Neill Malcolm, K.C.B., D.S.O., chairman of British Benzol and Coal Distillation, Ltd., at the twelfth annual general meeting of that company, which was held in London on Thursday of last week. General Malcolm made the suggestion, which has been voiced elsewhere also, that the tax should be reduced from 100 per cent. to 80 per cent., and that the remaining 20 per cent. should be compulsorily lent to the Government. It would be placed in reserve and invested in Government bonds until some fixed period after the conclusion of the war, when it would become available for necessary expenditure and consequent employment of labour. If this were done, the Government would have the use of the money now, at a time when it is urgently needed, and a certain inducement to economy, lacking at present, would be forthcoming—so that the Government would actually get more money from Industry than is accruing at present.

ORGANIC CATALYSIS
Important Work in a Widening Field

by G. S. RANSHAW

THE catalytic phenomenon is one that has been observed and commented on since the early days of chemistry, but it is only since the beginning of the present century that the catalyst has assumed the scientific and industrial importance it now possesses. The inversion of sugar under the action of acids was commented on by Kirchoff as early as the beginning of the 19th century, the points of interest being that the acid used did not take part in the reaction and that a very small quantity of acid was able to transform an enormous quantity of sugar. The phenomenon excited a good deal of curiosity at the time, but the mechanism of this and similar reactions discovered subsequently remained a mystery. Thus, Thénard, the discoverer of hydrogen peroxide (1824), perceived that it was ordinarily stable in aqueous solution, but that a little manganese dioxide provoked immediate decomposition. Mitscherlich, also, in his studies of the dehydration of alcohols by sulphuric acid, remarked that a tiny proportion of acid was sufficient to prepare a large quantity of etheroxide. It was in describing this phenomenon that Berzelius is credited with employing the term "catalyst" for the first time, but the idea roused the hostility of certain scientists, particularly that of Liebig, who considered the question a merely mechanical one expounded by his "théorie des ébranlements."

From the work of Pasteur shortly afterwards, a certain analogy became apparent between the action of his "ferments" and that of catalysts. Yet Pasteur himself believed fermentation to be a manifestation of the life of certain animal organisms—or vegetable ones. Without life, there was, for Pasteur, no fermentation. The heated controversies to which this point of view gave rise were not settled till 1897, by Buchner. Buchner showed that if the yeast cells were ground up, certain precautions being taken, the juice obtained was as active as the yeast itself. Moreover, by treatment with alcohol, a body "zymase" can be precipitated from the solution, which body constitutes in itself alone the "ferment." Other ferments were soon isolated, mainly from animal glands, and the "vital" theory of fermentation was ultimately discredited.

Since life does not intervene, however, a purely chemical reaction is involved, and thus the whole question of the mechanism of a phenomenon known for so long as the fermentation of alcohol aroused the intense interest of chemists. Gay-Lussac and Lavoisier who, amongst many other things, interested themselves in this problem, noted that glucose was transformed as a whole into alcohol and carbonic acid gas by fermentation. The reaction is written :—

$$C_6H_{12}O_6 = 2C_2H_6O + 2CO_2$$

but the symbolism avoids the difficulty and gives no idea that there may be intermediate stages. After much work a theory was advanced by Neuberg in 1913 which is generally recognised to-day. The first stage is the transformation :—

$$C_6H_{12}O_6 = 2CH_3.CO.COOH + 2H_2$$

There follows the oxidation of the glucose to pyruvic acid and the transformation of the latter into an aldehyde :—

$$CH_3.CO.COOH = CO_2 + CH_3.CHO$$

this aldehyde fixing, finally, the hydrogen freed in the first stage :—

$$CH_3.CHO + H_2 = CH_3.CH_2OH$$

By some the mechanism of the transformation of the glucose into pyruvic acid is still disputed, but the subsequent transformation of this acid is firmly established. Thus, to realise the transformation schematically it is only necessary provisionally to fix two hydrogens and to give them up later to the aldehyde. This, precisely, is the task of the ferment.

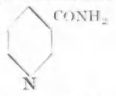
Thus the chemical mechanism of fermentation has been minutely studied, and it is the same with the nature and mode of action of the ferments themselves. The complexity of the ferment molecule has been apparent since 1904, when Young and Harden, having submitted zymase to dialysis, separated the ferment into a primary constituent of high molecular weight and protein character, called the apoferment, and a light molecule, the coferment. Taken separately, these two constituents are inert. Admixture of one with the other causes activity to reappear. Further study has shown that the apoferment constitutes a colloidal support of which the nature does not affect the reaction itself. On the contrary, it is the apoferment that determines the compounds susceptible to attack by the ferment, giving the latter its well-known "specific" nature : one of its most curious characteristics if it is remembered, for instance, that a ferment attacks more willingly one optical isomer than another (separation of tartrates by Pasteur). The other constituent of the ferment, the coferment, is, on the other hand, the seat of the chemical reaction. More precisely, in the coferment exist one or more active groups where the chemical transformations are effected.

It appears that the number of these coferments may be restricted and that it is the same coferments that ally themselves to the support of various molecules, giving the diversity of ferments we know of.

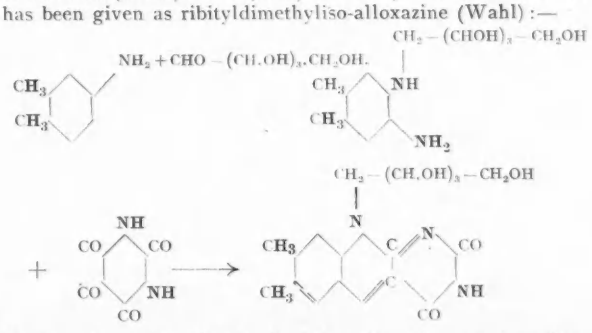
Returning to the last stage of the alcoholic fermentation process, it was indicated that it might be represented by the following equation :—

$$R.CHO + H_2 \rightarrow R.CH_2OH$$

The reaction is effected thanks to the zymase, and it is in the coferment of the zymase, the cozymase, that the seat of the reduction is to be sought. In 1936 V. Euler on the one hand and Warburg on the other separated from cozymase a definite chemical product, the nicotinic amide :—



Study of this compound showed that in the form of a quaternary ammonium salt (iodomethylate) is possessed the property of fixing reversibly two atoms of hydrogen. Thus it is one of the active groups of the cozymase. However, in itself it cannot effect the transformation of alcohol into aldehyde, and the reverse. It is necessary to join it with another ferment, known as Warburg's Yellow (respiratory) Ferment. Now Warburg, Kuhn and other workers have shown (1935) that the active part of the Yellow Ferment is identical with Vitamin B_2 (Vitamin G in America), isolated from milk or liver. The constitution of this vitamin has been established (Kuhn, Karrer, etc.) and its synthesis effected. It has been given as ribityldimethyliso-alloxazine (Wahl) :—



To transform this vitamin B_2 into yellow ferment it suffices to combine it with phosphoric acid and a colloidal support.

In the light of these facts the mechanism of a simple transformation such as the oxidation of alcohol to acetaldehyde

appears as a result of the transport of a hydrogen, according to the following scheme :—

Alcohol + Nicotinic Amide → Aldehyde + Dihydronicotinic Amide.

Dihydronicotinic Amide + Yellow Ferment → Nicotinic Amide + Hydrogenated Y.F.

Hydrogenated Y.F. + Air → Yellow Ferment + Hydrogen Peroxide (Water + Oxygen).

We thus see by what route the oxygen of the air, which in the molecular state is inert, provokes the oxidation of the alcohol.

A grave difficulty can occur here, however, for if the synthesis of the active groups of coferments is indeed realisable, the nature of the colloidal support indispensable to their activity remains relatively unsolved. Thus the complete synthesis of a ferment appears dependent on the resolution of this problem. Studies commenced some years ago by Langenbeck showed that there was a possibility of reaching a similar result by quite another route. The reference here is to what Langenbeck called " organic catalysts," and amongst these are to be found compounds important in the realm of tinctorial chemistry.

The first catalyst studied by this worker was isatin. Traube had showed in 1911 that isatin can oxidise the acid amines by transforming them into a coloured body which, however, he did not study. The reactions conducted started with glycocoll (aminoacetic acid) :—

$$NH_2.CH_2.COOH \rightarrow CH.COOH \rightarrow H.CHO + NH_3 + CO_2$$
$$\quad\quad\quad

THE LITHARGE PROBLEM

Its Treatment in the Recovery of Precious Metals

by C. C. DOWNIE

IN view of the fact that the ancient principle of collecting precious metals in lead is still persevered with, appreciable tonnages of litharge accumulate in gold and silver refineries. It is doubtful whether any agent used in precious metal recovery varies quite so widely in composition, since even matte and white-metal, or speiss, maintain a certain consistency.

Although lead constitutes the chief component, the other metals which have been oxidised at the same time vary in proportion to the whole and also in their ratio to one another. In some cases the literature describing refining processes is made unduly complicated by an absence of preliminary details dealing with the initial treatment. For example, some refiners make poor ores and residues (*i.e.*, those worth less than £200 per ton) into briquettes with the assistance of water-glass and fluxes, and smelt them in a blast-furnace. Richer materials are directly smelted on to lead with a covering of poor matte and slag in reverberatory furnaces. The products in each case, represented by rich lead, white-metal, matte, and slag, are more or less the same, except that the slag from the latter hearth has to be returned to the blast-furnace for complete reclamation.

The Ratio of Impurities

The white-metal, matte and slag have removed considerable proportions of the impurities, and the concentrated precious metals in the lead thus contain only a modicum of the original base metals present. Hence when litharge is removed from such lead during cupellation, the ratio of lead to other impurities may be maintained at a high figure. In other refineries, the initial treatment is curtailed, and cupellation applied at an earlier stage, whereby the ratio of impurities is higher. If the impurities are allowed to become too considerable, there is always the risk of the hearth of the "test" cracking, but most difficulties have been overcome by the application of improved refractories in place of the earlier bone-ash.

Litharge from the former treatment is relatively pure since the matte has withdrawn much of the copper and iron, whilst the white-metal has removed much of the nickel and antimony, which latter in turn absorb correspondingly increased proportions of arsenic, according to their ratios. In view of the fact that precious metal refiners owe a considerable debt to d'Hennin for introducing arsenical-lead for separating the constituents, some 50 years ago, one would expect such concerns to be familiar with the handling of white-metal, speiss, and all associated products. On the contrary, however, the very principles underlying the separations, the affinities and combinations which control the reactions, and the methods of manipulating them, appear to be unknown, or at any rate disregarded.

Of three firms which made use of the d'Hennin process, one made no attempt to manipulate the white-metal, or crude speiss, and simply accepted it in whatever condition it came from the furnace. The second firm, evidently acknowledging their inability to handle this complicated material by smelting methods, directly applied expensive chemical processes, while the third divided it into sections, or grades, and laboriously worked each out separately.

Excess of Copper

This lack of experience in what is recognised as the paramount feature of pyro-metallurgical work does not show the precious-metal smelter in a good light, and suggests that the work pertains rather to simple melting than to smelting. It is thus hardly to be wondered at that even where white-metal and matte are used to remove excess impurities, in the form of base metals, from rich lead, the litharge still contains appreciable foreign matter. When properly worked, the litharge should contain copper alone as the impurity, and even this should be present only in small proportion. Investigations revealed that this copper often amounted to from 12 to 13 per cent., owing to improper manipulation of the matte, and this meant that an excessive quantity of lead plates had to be added to the "test" to ensure complete removal of this impurity.

Where no preliminary treatment is accorded to the precious metal residues, the litharge is exceedingly impure, and can hold large but varying proportions of iron and nickel. Apart from these metals, the analysis of a number of samples averaged 70 per cent. lead oxide, 14.6 per cent. antimony oxide, 8.5 per cent. tin oxide, 4.2 per cent. arsenic oxide, and 2.6 per cent. copper oxide.

The precious-metal content of litharges varies very considerably, not only because of the base-metal impurities, but because the work of cupellation is frequently subdivided into sections. Whereas the actual cupellation is often performed in two stages, some firms prefer to keep one "test" hearth for pure silver products, *i.e.*, as distinct from those containing gold and silver, etc. Thus, rich silver precipitates from various chemical extraction processes may be directly cupellated, with but little lead, whereby the resulting litharge is correspondingly rich and contains upwards of 1400 oz. silver per ton. Where impurities are such that many lead plates are required, the resulting litharge may contain less than 100 oz. silver per ton. Gold varies from 10 to 20 oz. per ton, whilst platinum seldom exceeds 2 oz. per ton. Iridium, rhodium, ruthenium, and even osmium have shown their presence in litharge, but in such minute quantity as to be ignored for the time being. The search for these minute percentages in quantitative figures has been greatly assisted by the introduction of the spectrograph.

Liquating Litharge

Where cupellation is carried out on a comparatively small scale, the litharge which forms on the surface tends to contain more precious metal, but large "tests" offer more scope for the latter to sink. The litharge is tapped off periodically into bogies, and when solidified is emptied, and allowed to weather, as in this way it breaks down. The soft mass so obtained is mixed with coal dross and charged on to a small liquation hearth. No fluxes or addition agents are required, and the mass is simply gently heated so as to reduce the oxides to metallic condition.

Although the ancient coal-fired hearth is still maintained in some quarters, the oil-fired "sweater" has demonstrated its superiority, since much more accurate temperature control is obtained. Provided the correct heat is applied, the lead containing the bulk of the silver, etc., will separate from the copper and other base metals, which remain on the hearth. With the more crude type of sweating, using the coal-fired hearth, an appreciable amount of this coppery mass passes into the lead, but it may be separated by skimming the recovered lead. There are thus three products from the sweating operation; copper residues, lead and lead skimmings.

As the lead sweats out it is tapped into bogies, where it is allowed to settle for a few minutes, then skimmed with perforated ladles, and finally tapped into flat plate moulds. The copper residues contain sufficient silver to justify their return to the blast-furnace for recovery of the metal values.

The charge consists of 40 cwt. litharge, and about 5 cwt. coal dross, and the products average 20 cwt. lead, 10 cwt. copper residues, and 7½ cwt. skimmings. As arsenic passes into the litharge during the process of cupellation, the lead so obtained after reduction to the metallic state still retains this component, and reacts according to the d'Hennin prin-

ciple, *i.e.*, what little of the platinum metals are present are often found in the skimmings. The copper residues also contain arsenic and react in a similar manner, but the skimmed lead which is tapped into the plate moulds is almost completely free from precious metals other than silver, and the maximum gold is about 1 oz. per ton.

If the lead worked on the "test" has been exceedingly impure, repeated additions of lead plates are necessary, and the recovered lead from the liquation hearth may have as low a silver content as 100 oz. per ton, but where the process has been more direct, this may increase to 400 oz. As fresh argentiferous lead is being worked daily on the "test," too much lead would be recovered from the liquation hearth to be consumed as lead plates, and for this reason the liquation process is only periodically utilised, as the necessity arises.

The skimmings removed by the perforated ladles are accumulated until a few tons have been obtained, then mixed with 2 cwt. per ton of pyrites, and smelted on a reverberatory hearth. This process is usually repeated. The sulphur of the pyrites removes the bulk of the contained copper as matte, and evolves part of the arsenic as arsenic sulphide, but the lead is still impure, and is skimmed. This small bulk of skimmings is returned to the furnace and smelted with about 6 cwt. per ton of pyrites. The lead so obtained contains up to 600 oz. silver, 40 oz. gold, and from 0 to 10 oz. platinum per ton, and is used as the agent for picking up precious metal from goldsmiths' sweepings, and rich residues and concentrates.

Alternative Methods of Treatment

In view of the surplus of lead that accumulates from the continual production of litharge, advantage is taken of the oxidised condition of the latter to allocate a section of it to the smelting with fume, recovered from the different hearths. Although most smelters have adopted electrostatic fume-recovery plants, the wet condenser tower is still persevered with, and the resultant product is a crude lead sulphate. This wet mass is periodically removed from the towers, dried on waste-heat driers, and mixed with the requisite proportion of litharge and a small addition of coal dross. As the fume contains carbon from the different fire-grates, the proportion of coal dross is varied to bring the total carbon content to a fixed figure. The mass is charged on to a reverberatory furnace and smelted, so that the lead sulphate is partly reduced to sulphide, and the sulphate and sulphide react, producing lead and sulphur dioxide. Part of the sulphide is also acted upon by the litharge, giving similar products. Before tapping, about 1 cwt. scrap iron per ton of charge is added, to precipitate any remaining lead. The products are lead, poor matte, and slag.

This lead is much richer than that obtained from litharge alone, and has been known to reach 1400 oz. silver per ton, but this is accounted for by dust driven off from the surface of rich concentrates. The slag is returned to the blast-furnace, while both lead and matte are used for smelting with fresh consignments of "sweep" and residues.

As in the case of the surplus lead from continual litharge production, so the recovery of lead from fume and litharge also provides too much lead, *i.e.*, more than is required for the preliminary smelting of residues. Accordingly, when the accumulation of this lead has become too considerable, it is subjected to the Parkes process, whereby the gold and silver contents are removed by zinc, after which the pure lead is disposed of.

Many of the precious metal smelters place their faith in the time-worn theory that lead is essential for the collecting of gold and silver, etc., and the introduction of the d'Hennin process, using arsenical lead, enhanced rather than retarded the use of this agent. Litharge continues to accumulate, and lead circulates throughout the system of working with little prospect of abatement because of the lack of fresh methods.

A further means of disposing of the surplus litharge consists of partial reduction with a modicum of carbon in the form of fine coal smudge. By dint of accurate melting conditions, what little lead is reduced collects the silver and carries it as a silver-lead alloy, leaving the molten mass of litharge for complete reduction. In practice it was ascertained that the silver was never completely removed, which meant that the litharge, after full reduction to metallic lead, had to be subjected to the Parkes or other similar process.

Rarely, litharges are obtained with 13 per cent. of copper, and even more, and rather than cause the products to be scattered around the process, the mass is fused with poor matte directly. The charge in this case consists of 21 cwt. coppery-litharge, 8 cwt poor matte, and 2 cwt. coal dross, and produces an enriched copper matte and practically copper-free lead. Each of these examples goes to show the advantage that this class of work holds for the already established lead smelter, but to firms specialising in precious metals the continual handling of lead only makes additional unproductive work.

Zinc Removal

The Pattinson process, despite the improved mechanical equipment applied, has slowly fallen into disuse for desilverising lead, but a similar process was employed until quite recently for assisting the separation of complex tin-lead-antimony alloys by crystallisation. The Parkes process prevails to the present day and provides a crude form of litharge rich in zinc. A charge of 5 tons of argentiferous lead will require some 280 lb. of zinc added in 6 or 7 different portions, and although most of this is skimmed off after accumulating the precious metals, more than 1 per cent. of zinc is liable to remain in the lead. By steaming, this latter impurity is removed, and the lead rendered soft and pure for the market, but the litharge contains practically all the zinc oxide.

This type of litharge cannot be successfully sweated, as the zinc content links up the other constituents more in the form of a definite alloy. For this reason it is purposely held over and used up in charges of "sweep" and rich residues of a more highly refractory nature necessitating high temperatures. Although the zinc can be made to burn off with ease, the volatilisation causes some small content of silver to be removed simultaneously, but with a highly refractory charge the zinc is burned off first, after which the lead is reduced, and assists the fusion of the mass. Among the constituents that increase refractoriness are carbon, and alumina from the residue of old refining pots. The foregoing litharge oxidises and gets rid of the objectionable carbon, whilst the fluxing of the alumina, although not directly attacked, is influenced by the easier accompanying melting mass.

Lead-Antimony Mixtures

Similarly, crude litharge is used for the making of briquettes for the blast-furnace charge, but the material removed from the steaming of lead in the Parkes process contains too many metallic particles to ensure a sound body. For this reason it is ground and sieved, and the fine mass only used for briquettes. Antimony, which if present in appreciable quantities can interfere with the removal of silver by zinc, tends to remain in the lead, and is oxidised by the steaming, and thus passes into the litharge. When it is known that the final lead contains antimony, a good plan is to leave the surface covered with litharge for some time without skimming, as the lead is thus replaced by antimony in the litharge. The antimony is more rapidly removed, and further, the resulting mass does not contain so many "metallics," and hence is more easily ground and sieved.

In conclusion, so long as lead is used as the agent for picking up precious metals, litharge will have to be dealt with in its different forms, with its attendant troubles such as hearth-corrosion, poisoning, and unhealthy conditions, but it is contended that in the future such work will only be continued by lead smelters, whilst alternative methods will be substituted elsewhere, in order to economise in time and labour.

Personal Notes

MR. ERIC STAFFORD ELSON, employed at the Gaskell-Marsh Works of I.C.I. (General Chemicals), Ltd., has been awarded the Rudolph Muspratt prizes for chemistry by the Governors of the Widnes Technical College.

MR. L. A. LANTZ, engineering chemist, has been nominated as the civil representative of General de Gaulle for Manchester, Lancashire (except Bolton), and Cheshire.

OBITUARY

MR. OSCAR CHRISTOPHERSON, who died at Bromley on December 19, was for many years managing director of the Nitedals Match Co., Ltd., and was a well-known member of the Norwegian community in England.

Chemical Matters in Parliament

Cement Manufacture

IN the House of Commons last week, Mr. Hicks, Parliamentary Secretary to the Ministry of Works, replying to a question by Mr. Lawson, stated that he had received a report of the committee appointed by the Controller of Building Material to report on the immediate manufacture of blast-furnace cement. Instructions, he said, had been given to certain cement and iron works to instal the necessary plant for the manufacture of such cement, using the most suitable slags available in the country. He had been assured of the willing co-operation of all concerned.

It was hoped that the manufacture of the product would begin in time for the spring. Steps had been taken to increase grinding capacity in certain works. Of the two small works which were being brought back into operation one was now structurally ready to start operating, and the other would be ready before the end of January.

With regard to the promotion of new cement works, which required the provision of new machinery to come into effect at a later date, Lord Reith, the Minister of Works and Buildings, had accepted the recommendation of the Controller, Lord Wolmer (a past president of the Cement Manufacturers' Association), that an independent committee should be appointed to consider the whole matter.

Mr. Lawson asked how much blast-furnace cement these arrangements would provide, and said there were large quantities of slag which could be used to make cement for air-raid shelters.

Mr. Hicks replied that the total quantity of this cement which could be obtained from the most suitable slag, which was hæmatite slag, was less than 300,000 tons a year. Fantastic claims had been made for slag cement, but it had a low cementation value, and in order that that quantity should have the desired value, at least 600,000 tons of Portland cement would have to be withdrawn. The committee would inquire into the present manufacture of cement, whether the facilities for manufacture were inadequate and, if so, what resources could be used to increase them.

FOOT-OPERATED AIR VALVE

There are so many duties which machine operatives can only perform with their hands that any device enabling foot control to be applied is well worth consideration, since the hands are left free for other work. With this in mind B.E.N. PATENTS, LTD., of High Wycombe, have produced a Foot-Operated Air Valve designed for floor mounting, which can be used to control compressed air operated machines or cylinders requiring a straightforward "on" and "off" control. An alternative model provides "on" and "off" control with free exhaust when in the closed position and, amongst other things, is suitable for actuating single acting among other things, is suitable for actuating single acting Both models combine instant control with minimum effort.

Industrial Psychology

Report of the National Institute

THE annual report of the National Institute of Industrial Psychology shows that the early months of this, the twentieth year of the Institute's work, were shadowed by uncertainty. The outbreak of war affected its vocational guidance and educational work and in the first few months of the adaptation of industry to war production there was little opportunity for industrial investigations. With the new year, however, the position became clearer and brighter. An increasing number of firms turned to the Institute for advice on problems greatly intensified by the war, such as recruitment and training of staff, re-training operatives on new tasks, hours of work, the introduction of test pauses, and working conditions in the "black-out."

The report gives special prominence to the rapid and effective training of industrial workers, including women. Since the war the Institute has been busy devising schemes for training operatives in engineering and allied processes and a notable example of results obtained in training women solderers is quoted. Dealing with hours of work, the report refers to the danger of operatives working hours so long as to be both harmful and wasteful. This danger is now becoming recognised, but the Institute adds a timely word of warning to executives who still attempt to work fourteen hours a day seven days a week.

Liquid Nitrogen Tetroxide

Avoiding Corrosion and Explosive Risks

NITRIC acid of very high concentration can be manufactured with the aid of pure nitrogen tetroxide, while the production of the nitroparaffins, which are solvents and intermediates of growing importance, involves the use of nitrogen tetroxide as nitrating agent (see, *e.g.*, B.P. 527,031, I.C.I., Ltd.). The direct liquefaction of gases containing nitrogen tetroxide is complicated by the highly corrosive nature of the condensate which takes a heavy toll of compressing plant components. Another difficulty is represented by the explosive nature of mixtures formed when the nitrous gases come into contact with ordinary lubricating oils.

Means for overcoming these difficulties are described in B.P. 528,387 (November 13, 1940) of the Du Pont concern. They include the use of a compressor of the reciprocating and non-lubricated type in which one of the wearing surfaces is a smooth metal, while the other contains a graphitic composition (further details in B.P. 456,054). A suitable gaseous mixture for working up to pure liquid nitrogen tetroxide is one obtained by burning an ammonia-air mixture (11.5 per cent. ammonia) in an ammonia converter to yield a gas containing 173 lb. water per 100 lb. ammonia consumed and a mixture of nitrogen oxides. Before treatment in the compressor, this is cooled to not more than 40° F. and the gases separated from the aqueous condensate. The non-lubricated compressor is operated at a temperature which is never allowed to exceed 180° C., in order to reduce corrosion to a minimum.

ANTHRACENE RESINS

According to Russian Pat. 53,396 the product of interaction between anthracene and maleic anhydride can be further condensed with polyhydric alcohol (glycerol, glycol, etc.) to form resins of various degrees of hardness according to the conditions of reaction. Earlier work on the reaction of anthracene with maleic anhydride (M.I. Poliakova, *Koks i Khimia*, February-March, 1938, pp. 75-81) had shown that other constituents of crude anthracene (carbazole, phenanthrene) do not react with maleic anhydride, and that this selective reaction could be applied to separation of the anthracene, carbazole and phenanthrene in the pure forms from crude coal tar fractions.

General News——
——From Week to Week

THE ADDRESS OF THE Chrome Ore, Magnesite, and Wolfram Control is now Broadway Court, Broadway, Westminster, S.W.1.

IT IS STATED that the factory that is to produce the aneurin which provides vitamin B1, for introduction into white bread, is expected to go into production in January.

THIEVES WHO BROKE INTO THE PREMISES of F. W. Berk, Ltd., chemical manufacturers, in Canning Town, E., last week, stole five 19-lb. bottles of mercury, valued at £200 in all.

CONTRIBUTIONS to Paisley War Weapons Week include £2500 from Isdale and M'Callum, Ltd., soap manufacturers; £10,000 from Brown & Polson, Ltd., Royal Starch Works, Paisley, £2200 from Brown & Polson's employees' savings group; and £5000 each from William MacKean, Ltd., and William Wotherspoon, Ltd., two local starch manufacturing firms.

MR. GEORGE HICKS, whose remarks in the House of Commons are reported elsewhere in our columns, made chemical (and etymological) history last week when he coined the word "cementitious" to describe the cement-making quality of a substance. Mr. Hicks has had practical experience of building, so, like another celebrated character connected with walls, he has the right to make a word mean what he wants it to mean.

Foreign News

CONCENTRATED SOLUTIONS of magnesium fluosilicate were obtained by I. I. Zaring (*J. Chem. Ind. U.S.S.R.*, 1940, *6*, 26) by neutralising hydrofluosilicic acid with magnesia and spraying the solution into a hot gas chamber. Solutions containing 55 to 60 per cent. of $MgSiF_6.6H_2O$ were prepared without difficulty.

A PRESS REPORT from the U.S.S.R. states that a group of scientists and experts have produced from Kusinsk titano-magnetites, in a charcoal furnace, naturally alloyed vanadium pig iron, free from sulphur and phosphorus. It is claimed that naturally alloyed vanadium pig iron has not previously been produced, either in the U.S.S.R. or elsewhere.

EXPERIMENTS IN RUSSIA have shown that the use of lignite for running gas-producer automobiles is feasible, and that, even under the most difficult road and climatic conditions, the performance of automobiles working on lignite has been found to be as good as those working on benzine, and sometimes better. The lignite used had an ordinary moisture content of 24-28 per cent., an ash content of 9-12 per cent. and a 1 per cent. sulphur content.

SHORTAGE OF COCOA BUTTER for pharmaceutical purposes in Italy has led to the introduction of a number of alternatives with approximately the same melting point. The following formulae are given by U. Santi (*Boll. Chim. Farm.*, 1940, *79*, 97): (a) 6 parts lanolin, 3 spermaceti, 1 olive oil; (b) 1 part lanolin, 1 paraffin, 1 olive oil; (c) 9 parts lanolin, 1 stearin, 3 triethanolamine stearate. Melting points of these ternary mixtures are respectively 41.5, 41, and 43° C.

RECENT WORK BY K. H. Meyer and collaborators (*Helv. Chim. Acta*, 1940, *23*, 845-890) on the nature of maize starch has revealed the presence of two main components; amylose, which is present to the extent of 10 to 20 per cent. and consists of straight chain polymers with molecular weights of 10-60,000; and amylopectin (80-90 per cent.) branched molecules with molecular weights ranging from 50,000 to one million. The amylose is readily extractable with hot water and can be dissolved in ethylene diamine hydrate or in zinc chloride. It readily forms a triacetate which compares with cellulose triacetate in respect of solubility in ethyl acetate.

A METHOD FOR THE PREPARATION of anhydrous ferric alums, such as $K[Fe(SO_4)_2]$, is described by N. V. Shishkin in *J. Gen. Chem. U.S.S.R.*, 1940, *10*, 271. A strong solution of crystalline ferrous sulphate containing an excess of an alkali metal sulphate (or ammonium sulphate) and some hydrochloric acid is oxidised with nitric acid. Filtration of the boiled reaction mixture is followed by the addition of sulphuric acid to the filtrate, and evaporation to 50 per cent. of the original volume. Finally the precipitate is filtered, washed with alcohol and dried over sulphuric acid. These alums take the form of cream-coloured hexagonal plates with fair resistance to water.

A METHOD FOR THE DETERMINATION of carbon monoxide in concentrations of 0.1 to 0.002 per cent. is described by Mr. F. Cook, of the Bituminous Casualty Corporation, Rock Island, Illinois, U.S.A., in *Ind. Eng. Chem.* (Anal. Ed.), 1940, *12*, 11, 661-2. The apparatus described is designed as an accessory to standard gas-analysis equipment and requires a set of special colour standards. The determination may be run either independently or in conjunction with other gas analysis. The method is an improvement, for general application in laboratory gas analysis, on the standard method of Sayers and Yant in that the necessity of opening the sample bottle in the laboratory is obviated, and the test-sample may be collected by any method, wet or dry.

Forthcoming Events

A JOINT MEETING of the Food Group of the Society of Chemical Industry with the London Section of the Society will be held at Burlington House, Piccadilly, London, W.1, on January 6 at 2 p.m., when Dr. W. T. Astbury will deliver the first Jubilee Memorial Lecture. His subject is "Proteins."

A JOINT MEETING of the Institution of Chemical Engineers and the Chemical Engineering Group (Society of Chemical Industry) will be held on January 14, 1941, at 2.30 p.m., in the Rooms of the Geological Society, Burlington House, Piccadilly, W.1, when a paper on "Modern Developments in the Design of Plant for the Concentration of Sulphuric Acid," will be presented by Mr. P. Parrish, F.I.C., M.Inst.Gas E. The Chair will be taken by the President of the Institution, Mr. F. Heron Rogers.

Chemical and Allied Stocks and Shares

AS was to be expected, business on the Stock Exchange has been reduced by holiday considerations. Nevertheless, the undertone in most sections has been firm, and it is being pointed out that, although many industrial securities have shown sharp fluctuations during the past twelve months, in numerous instances they are closing 1940 at prices which compare not unfavourably with those ruling at the end of 1939.

Imperial Chemical at 28s. 9d. have more than maintained their recent improvement; during the year, highest and lowest prices were 33s. 7½d. and 17s. 9d. and the price at the end of December, 1939, was 30s. 6d. Turner & Newall, which were assisted by the maintenance of the dividend and were firmer than a week ago at 63s. 9d. were 65s. 9d. at the end of 1939; highest and lowest in 1940 were 68s. and 42s. 6d. Boots Drug's extremes this year have been 44s. 9d. and 27s. 9d.; the current price is 37s. 6d. which compares with 40s. at the end of 1939. Distillers ordinary units (66s. 6d. a year ago) are now 64s. 6d. and during the past twelve months the extreme prices recorded were 70s. 9d. and 46s. In the case of Courtaulds the highest this year has been 39s. 10½d. and the lowest 20s.; the current price is 31s. 9d. and a year ago it was 38s. Debentures and other fixed-interest securities of most companies in the chemical and kindred industries have moved in favour of holders, having been assisted by the trend in Government stocks. Imperial Chemical 7 per cent preference units, for instance, are now 32s. 10½d. and at the end of 1939 they were 30s.; the extreme prices in 1940 have been 33s. 9d. and 23s. 3d.

Lever & Unilever at 23s. 9d. were little changed on the week, while Lever & Unilever N.V., in which dealings were resumed last week, were quoted at 16s. 3d. British Aluminium were 3d. better at 40s. 9d. and British Oxygen improved to 63s. 1½d. Textile securities tended to be firmer this week, aided by the good impression created by the Lancashire cotton results. Courtaulds preference units improved to 24s. 3d., while British Celanese first preference made the better price of 17s. 6d. Michael Nairn & Greenwich remained at 47s. 6d., awaiting publication of the financial results, while Barry & Staines were 24s. 4½d. Movements among iron and steel securities were again small, but included an improvement to 39s. 6d. in Babcock & Wilcox. Allied Ironfounders made the slightly better price of 39s. 6d. and elsewhere, Tube Investments moved up to 91s. 10½d. B. Laporte were again 51s. 3d., but were firmly held and inactive. Greeff-Chemicals Holdings 5s. units continued to be quoted at around 6s. and Monsanto Chemicals preference shares were again 22s. 6d. British Match remained at 30s. 9d. and Pinchin Johnson at 18s. were slightly better than a week ago. Wall Paper Manufacturers deferred units were higher at 21s. 3d. United Molasses were 3d. better at 23s.

General Refractories remained at 7s. 6d. but British Plaster Board were easier at 11s. 9d. and Associated Cement were 58s. 1½d. Beechams Pills deferred shares had a steady appearance this week at around 8s. 4½d. Timothy Whites were 19s. 9d. and Sangers kept at the lower lever of 18s. 6d. Oil shares lost part of their recent good advance, and Anglo-Iranian were 36s. 10½d. compared with 40s. a week ago, while Burmah Oil were easier at 51s. 3d. "Shell" at 38s. 9d. were unchanged on balance.

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

SALT BATHS FOR HEAT TREATMENT OF METALS.—Birmingham Electric Furnaces, Ltd., and E. C. Hipkins. 16309.

MOULDING COMPOSITIONS.—British Rubber Producers' Research Association, and F. J. W. Popham. 16205.

METHYLENE MALONIC ESTERS and interpolymers produced from same.—British Thomson-Houston Co., Ltd. (United States, November 16, '39.) 16440.

GAS-FILTERS.—Chema Manufacturing Co., Ltd., and M. Sigmund. 16275.

METHOD OF CARBONATING LIME and separating same from magnesia.—G. M. Clark (New England Lime Co.). 16363.

PRODUCTION OF RIBOFLAVIN by butyl-alcohol-producing bacteria. Commercial Solvents Corporation. (United States, Oct. 24). 16445, 16446, 16447.

POLYMERISATION OF VINYL COMPOUNDS.—Distillers Co., Ltd., and H. P. Staudinger. 16351.

POLYMERISATION REACTIONS.—Distillers Co., Ltd., H. P. Staudinger, K. H. W. Tuerck, and C. A. Brighton. 16267.

MANUFACTURE OF NAPHTHOSELENAZOLES.—Imperial Chemical Industries, Ltd. (Du Pont de Nemours and Co.). 16313.

MANUFACTURE OF ALKALI METAL ALIPHATIC SULPHONATES.—Imperial Chemical Industries, Ltd. (Du Pont de Nemours and Co.). 16314.

MANUFACTURE OF RESIN-IMPREGNATED COMPRESSED WOOD MATERIAL. Jicwood, Ltd., and R. L. J. Farina. 16342.

MANUFACTURE OF MONOAZO ACID DYESTUFFS.—A. H. Knight, and Imperial Chemical Industries, Ltd. 16315.

TREATMENT OF FABRICS.—J. R. Myles, F. J. Siddle, D. Whittaker, and Imperial Chemical Industries, Ltd. 16258.

PREPARATION OF SODIUM HYDROXIDE.—Ocean Salts (Products), Ltd., and B. A. Adams. 16355.

PREPARATION OF SULPHUR COMPOUNDS.—Ocean Salts (Products), Ltd., and B. A. Adams. 16356.

TREATMENT OF THREADS, yarns, etc.—H. E. Potts (Copeman Laboratories Co.). 16203.

PREPARATION OF PHENOLIC SUBSTANCES.—F. A. Robinson, B. A. Hems, and Glaxo Laboratories, Ltd. 16335.

STABILISATION OF THE ANTISCORBUTIC ACTIVITY OF MATERIAL containing vitamin C.—Roche Products, Ltd., F. Bergel, V. C. E. Burnop, A. Cohen, and A. L. Morrison. 16450.

PRODUCTION OF LATEX.—Rubber-Stichting. (Netherlands, Oct 30, '39.) 16198.

MANUFACTURE OF PROTECTIVE COATINGS for metals.—H. W. Smith, and S. G. Campbell. 16341.

PREPARATION OF HYDROCARBON conversion catalysts.—Standard Oil Co. (United States, Nov. 27, '39.) 16323.

MANUFACTURE OF LUBRICANTS.—Standard Oil Development Co. (United States, Dec. 5, '39.) 16378.

METHOD AND APPARATUS FOR CARBURETTING ORGANIC COMPOUNDS. J. L. Strevens, and W. B. Mitford. 16453.

METHOD AND APPARATUS FOR PRODUCTION OF SHEETS OF GLASS SILK. Versil, Ltd., and S. Palmer. (Dec. 22, '39.) 16338, 16339.

Complete Specifications Open to Public Inspection

MIXED ANHYDRIDES of formic acid and acrylic and the alpha substituted acrylic acids.—Norton Grinding Wheel Co., Ltd. April 1, 1939. 5632/40.

METHOD OF CONCENTRATING LATEX in centrifugal separators. A. B. Separator. April 3, 1939. 6010/40.

PRODUCTION OF OXY SUBSTITUTED ALDEHYDES.—E. I. du Pont de Nemours and Co. April 4, 1939. 6087/40.

JOINT PRODUCTION OF ACETONE and cyclohexane.—E. I. du Pont de Nemours and Co. April 4, 1939. 6088/40.

MANUFACTURE OF POLYMERIC MATERIALS.—E. I. du Pont de Nemours and Co. April 4, 1939. 6089/40.

PROCESS FOR MAKING HIGHLY-ACTIVE BLEACHING-EARTHS by degradation by means of sulphuric acids.—Ipari Robbanoanyag Reszvenytarsasag (A.G.- fur Industrielle Sprenstoffe), and H. Berczeli. April 6, 1939. 6113/40.

PROCESS FOR THE MANUFACTURE OF NAPHTHALENE DERIVATIVES.—Sandoz, Ltd. April 5, 1939. 6168/40.

CELLULOSE ESTERS.—British Celanese, Ltd. April 6, 1939. 6218/40.

MANUFACTURE AND PRODUCTION OF PLASTICISED VULCANISABLE POLYMERISATION PRODUCTS.—I. G. Farbenindustrie. April 1, 1939. 7074/40.

MANUFACTURE AND PRODUCTION OF DIOLEFINES.—I. G. Farbenindustrie. April 6, 1939. 7076/40.

PROCESS FOR RECLAIMING RUBBER VULCANISATES.—I. G. Farbenindustrie. April 1, 1939. 7267/40.

PROCESS FOR MANUFACTURING, in the electric furnace, alloys having a very low carbon content.—Soc. Electro-Metallurgique de Saint-Béron. May 9, 1939. 16989/39.

CONTAINER OF ORGANIC PLASTIC MATERIAL.—Monsanto Chemical Co. Sept. 30, 1938. 25368/39.

FURNACE FOR CATALYSIS with high thermic efficiency.—Ateliers Pingris and Mollet-Fontaine Réunies. May 11, 1939. (Cognate Application, 375/40.) 374/40.

PROCESS FOR THE PREPARATION OF MONOCARBOXYLIC ACID ESTERS of polymethylol phenols.—Resinous Products and Chemical Co. May 10, 1939. 4046/40.

PROCESS FOR THE PRODUCTION OF ACRYLIC INTERPOLYMERS.—Norton Grinding Wheel Co., Ltd. April 18, 1939. 5633/40.

PROCESS FOR THE REMOVAL OF WEAKLY ACID-REACTING SUBSTANCES from water-insoluble organic liquids.—N. V. de Bataafsche Petroleum Maatschappij. May 5, 1939. 6097/40.

WETTING AND EMULSIFYING COMPOSITIONS.—American Cyanamid Co. May 9, 1939. 6486/40.

HYDRAULIC FLUIDS.—E. I. du Pont de Nemours and Co. May 11, 1939. 7832/40.

COMPOSITE PAINTS and method of manufacturing the same.—A. F. X. F. A. Claessens. May 9, 1939. (Cognate Application, 7841/40.) 7841/40.

VITAMIN B COMPLEX.—Lederle Laboratories, Inc. May 11, 1939. 7848/40.

ESTERS AND ETHER-ESTERS of oxy-substituted acetic acids.—E. I. du Pont de Nemours and Co. May 6, 1939. 8103/40.

APPARATUS FOR MOULDING PLASTIC MATERIALS.—Hartford-Empire Co. May 10, 1939. 8130/40.

ALKYLATION OF HYDROCARBONS.—Texaco Development Corporation. May 11, 1939. 8231/40.

FLUORESCENT SCREENS.—British Thomson-Houston Co., Ltd. May 9, 1939. 8259/40.

PROCESS FOR WORKING-UP ACQUEOUS FORMALDEHYDE SOLUTIONS. British Celanese, Ltd. May 9, 1939. 8337/40.

MANUFACTURE OF POLYAMIDE COMPOUNDS OF HIGH MOLECULAR WEIGHT.—I. G. Farbenindustrie. May 6, 1939. 8446/40.

MANUFACTURE OF AZO-DYESTUFFS.—Soc. of Chemical Industry in Basle. May 11, 1939. (Cognate Application, 8448/40.) 8447/40.

PRODUCTION OF ORGANIC METALLIC COMPOUNDS.—Titanium Alloy Manufacturing Co. May 11, 1939. 8495/40.

RESINOUS COMPOSITIONS.—Kodak, Ltd. May 4, 1938. (Divided out of 13390/39.) 15765/40.

Complete Specifications Accepted

EXTRACTION OF MIXTURES OF ISOMERIC ORGANIC COMPOUNDS.—J. G. Fife (N. V. de Bataafsche Petroleum Maatschappij). March 28, 1939. 527,030.

PRODUCTION OF NITRO-PARAFFINS.—N. Levy, and Imperial Chemical Industries, Ltd. March 28, 1939. 527,031.

ABSORPTION OF NITROGEN OXIDES to form nitric acid.—Chemical Construction Corporation. March 30, 1938. 527,037.

PARASITICIDE.—Rohm and Haas Co., and Cornell Research Foundation. May 6, 1938. 527,054.

PROCESS OF MANUFACTURING PETROLEUM-LIKE OIL by dry distillation of a carbonaceous material.—Zaidan Hojin Rikagaku Kenkyujo. June 23, 1938. 527,055.

HARD METAL CARBIDE ALLOYS and processes of making the same. J. J. Haesler, and C. Eisen. April 14, 1938. 527,064.

SOLVENT EXTRACTION PROCESS.—Standard Oil Development Co. June 4, 1938. 527,299.

ELECTRODEPOSITION OF METALS.—E. I. du Pont de Nemours and Co. March 30, 1938. 527,084.

PREPARATION OF CATALYSTS for hydrogenation.—Fabriques de Produits Chimiques de Thann et de Mulhouse. April 11, 1938. 527,088.

PREPARATION OF COMPOUNDS OF CERIUM.—Soc. de Produits Chimiques des Terres Rares. April 13, 1938. 527,089.

GRANULATION OF CALCIUM SUPERPHOSPHATE and mixed fertilisers containing phosphate and nitrogen with or without potassium. Sturtevant Engineering Co., Ltd., and P. Parrish. March 31, 1939. 527,302.

CATALYTIC HEATING-APPARATUS.—Soc. Lyonnaise des Rechauds Catalytiques S.A. April 21, 1938. 527,114.

RECOVERY OF SILVER from waste hyposulphitic liquids.—T. Muhlethaler, S.A. April 15, 1938. 527,116.

PRODUCTION OF MAGNESIUM from its compounds.—Alloy Processes, Ltd. (L. S. Armandias). April 1, 1939. (Cognate Application, 18932/39.) 527,124.

METHOD OF AND APPARATUS FOR CONVERTING HYDROCARBON OILS. M. W. Kellog Co. April 2, 1938. 527,307.

MANUFACTURE OF DISAZO DYESTUFFS.—Durand and Huguenin, A.G. April 4, 1938. 527,221.

TREATMENT OF HIGHLY FERRUGINOUS YELLOW OCHRE EARTH.—F. Kuki. April 3, 1939. 527,181.

PRODUCTION OF ALCOHOLS from olefines.—E. I. du Pont de Nemours and Co. April 5, 1938. 527,316.

MANUFACTURE OF THIOLACTAMS.—Imperial Chemical Industries, Ltd. April 4, 1938. 527,317.

METHOD AND APPARATUS FOR PREPARING CONCENTRATES OF SAP.—A. Nyrop. April 4, 1939. 527,318.

SEPARATION OF AMINO ACIDS from acid hydrolysates of proteins. G. Toennies. May 7, 1938. 527,320.

METHOD FOR THE PRODUCTION OF HYDROGEN.—M. W. Kellog Co. April 18, 1938. 527,242, 527,243.

SAPONIFICATION OF TEXTILE MATERIALS containing an organic ester of cellulose.—British Celanese, Ltd. April 6, 1938. 527,328.

WORKING-UP COPPER from copper mud containing lime and cellulose.—British Bemberg, Ltd. November 12, 1938. 527,338.

WASHING OF PRECIPITATED MAGNESIUM HYDROXIDE.—Ocean Salts (Products), Ltd., and B. A. Adams. July 27, 1939. 527,139.

METHOD OF MANUFACTURING MANGANESE DIOXIDE.—British Thomson-Houston Co., Ltd. (Tokyo Electric Co., Ltd.). May 16, 1939. 528,882.

REACTION CHAMBERS.—Standard Oil Development Co. Oct. 12, 1938. 528,883.

MANUFACTURE OF TITANIUM DIOXIDE PIGMENTS.—National Titanium Pigments, Ltd., I. E. Weber, and A. N. C. Bennett. May 18, 1939. 528,955.

ZIRCON REFRACTORIES, and methods of making same.—Titanium Alloy Manufacturing Co. Feb. 10, 1938. 528,845.

WELDING.—Haynes Stellite Co. (March 11, 1938.) 528,901.

REMOVING ORGANIC ACIDS from water-insoluble organic liquids.—J. G. Fife. (N. V. de Bataafsche Petroleum Maatschappij). March 30, 1939. 528,904.

PRODUCTION OF CELLULOSE COMPOUNDS and the treatment of cellulosic textile materials.—Courtaulds, Ltd., and T. H. Morton. April 4, 1939. 528,740.

DYEING OF CELLULOSIC TEXTILE MATERIALS.—Courtaulds, Ltd., J. Boulton and T. H. Morton. April 4, 1939. 528,741.

TREATMENT OF CASTOR OIL to render it soluble in mineral oils.—R. I. Levi. April 6, 1939. 528,847.

PURIFICATION OF COMBUSTIBLE GASES.—Gas Light and Coke Co., and R. H. Griffiths. April 6, 1939. (Addition to 489,398.) 528,848.

PURIFICATION OF GELATINE.—Permutit Co., Ltd., and E. L. Holmes. April 6, 1939. 528,850.

TREATMENT OF ALUMINIUM and aluminium base alloy surfaces.—Aluminium Colors, Inc. May 3, 1938. 528,748.

PLASTIC COMPOSITION.—F. G. Denton. May 2, 1939. 528,750.

MANUFACTURE OF DIHALOGENOBUTANES.—E. I. du Pont de Nemours and Co. May 2, 1938. 528,691.

MANUFACTURE OF α-CHLOROACRYLIC ACID ESTERS.—J. W. C. Crawford, N. McLeish, and Imperial Chemical Industries, Ltd. May 4, 1939. (Addition to 514,619.) 528,761.

ELECTRODEPOSITION OF COPPER.—E. I. du Pont de Nemours and Co. May 4, 1938. 528,762.

REVIVIFICATION OF DECOLORISING ADSORBENTS.—Standard Oil Development Co. September 27, 1938. 528,766.

PHOTOGRAPHIC SENSITISING DYESTUFFS.—R. B. Collins and J. D. Kendall. (Samples furnished.) 528,803.

MANUFACTURE OF VISCOSE ARTIFICIAL SILK.—British Enka, Ltd., and H. D. Muller. May 5, 1939. 528,804.

MANUFACTURE OF AMIDINES.—Soc. of Chemical Industry in Basle. May 11, 1938. (Cognate Application, 13685/39.) 528,915.

CATALYTIC REACTION APPARATUS.—Standard Oil Development Co. Oct. 12, 1938. 528,919.

CONCENTRATION OF SULPHURIC ACID.—Bamag, Ltd., and A. H. Manning. May 12, 1939. 528,696.

HYDROGENATING CATALYSTS.—Standard-I.G. Co. May 20, 1938. 528,780.

TITANIUM PIGMENTS.—National Titanium Pigments, Ltd., I. E. Weber, and A. N. C. Bennett. May 15, 1939. 528,810.

APPARATUS FOR THE ELECTROSTATIC DEPOSITION of particles suspended in gases.—English Electric Co., Ltd., and W. Donnelly. May 15, 1939. 528,815.

PROCESS AND APPARATUS FOR THE PRODUCTION OF SYNTHESIS GASES mainly consisting of mixtures of carbon monoxide and hydrogen and of hydrocarbons therefrom.—N.V. Internationale Hydrogeneeringsoctrooien Maatschappij (International Hydrogenation Patents Co.). May 18, 1938. 528,826.

LUMINESCENT MATERIALS.—L. A. Levy and D. W. West. May 16, 1939. 528,828.

PRODUCTION OF LIGNIN.—Northwood Chemical Co. May 17, 1938. 528,921.

COMBINATIONS OF SOURCES OF RADIATION with luminescent materials.—General Electric Co., Ltd., H. G. Jenkins, and J. W. Ryde. May 16, 1939. 528,873.

ACETYLENE GENERATORS.—C. P. Keel. May 24, 1938. 528,875.

Chemical Trade Inquiries

Argentina.—An agent established at Buenos Aires wishes to obtain the representation of United Kingdom manufacturers of industrial chemicals for Argentina. (Ref. No. 570.)

Ecuador.—An agent established at Quito wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of aniline dyes, cement, chemicals and pharmaceuticals, disinfectants, insecticides, etc. (Ref. No. 571.)

South Africa.—A firm of agents established at Johannesburg wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of glue, potassium, chlorate and photographic chemicals for the Union and Rhodesia. (Ref. No. 569.)

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

PLASTILUME PRODUCTS, LTD., High Wycombe, acetate moulding manufacturers. (M., 28/12/40.) December 2, mortgage, to National Provincial Bank, Ltd., securing all moneys due or to become due to the Bank; charged on 136 Southfield Road, High Wycombe, etc. *——. January 2, 1940.

PARKIN NESS AND CO., LTD., Darlington, chemical manufacturers. (M., 28/12/40.) November 30, £850 debentures; general charge. *——. December 31, 1938.

DELAWARE OIL CO., LTD., London, W.C. (M., 28/12/40.) November 23, charge to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; charged on moneys due to the company from Lubricating Oil Pool. *——. February 10, 1940.

MITCHEL AND KING, LTD., London, W.C., metal dealers, etc. (M., 28/12/40.) November 26, debenture to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; general charge.

Satisfactions

A. E. HAWLEY AND CO., LTD., Hinckley, dyers, bleachers, etc. (M.S., 28/12/40.) Satisfactions December 4, of charge registered April 7, 1921, and of 1st debenture registered October 17, 1928.

County Court Judgments

V. W. CO., LTD., R/O, Warton Road, E.15, acetylene engineers. (C.C.J., 28/12/40.) £14 5s. October 22.

Company News

The Metal Box Co., Ltd., has declared an interim dividend of 5 per cent., less tax (last year the same), on the ordinary shares. For 1939-40 there was a final ordinary dividend of 10 per cent., and a bonus of 2½ per cent.

British Chemical Prices

Price Changes

Calcium Acetate.—Brown, £21 per ton; grey, £24. MANCHESTER: grey, £21 per ton.

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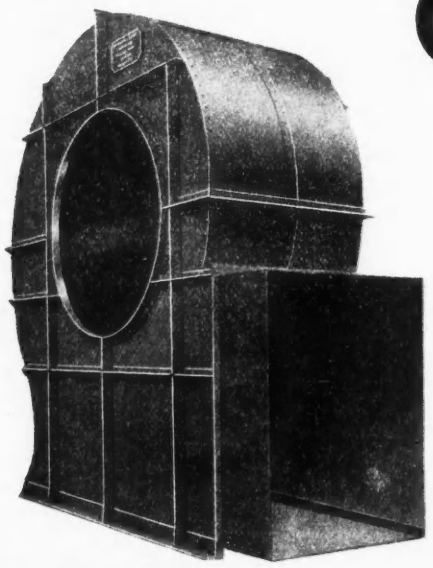

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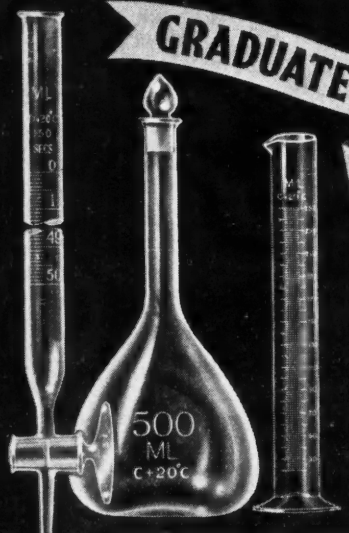

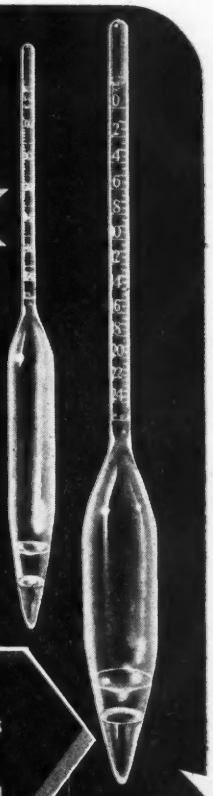

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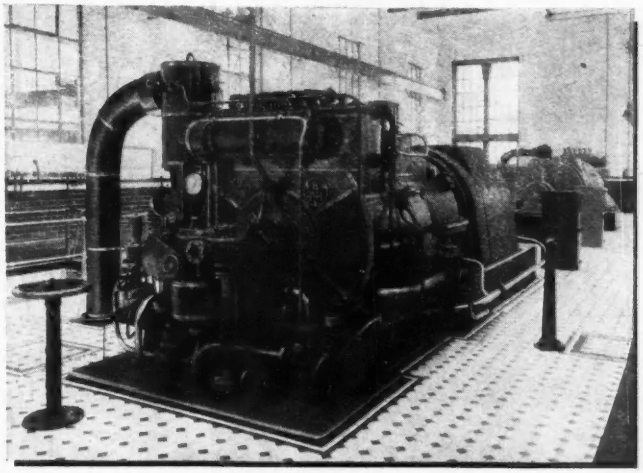

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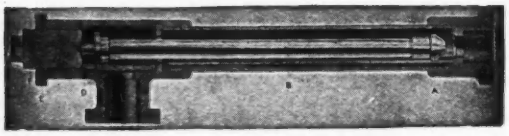

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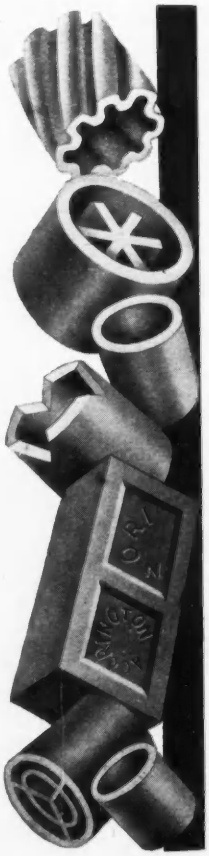

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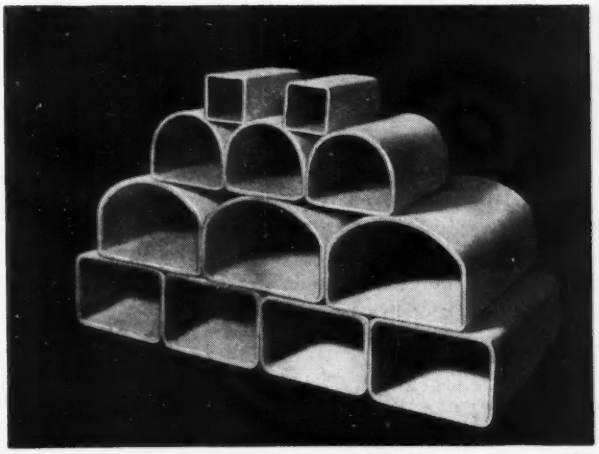

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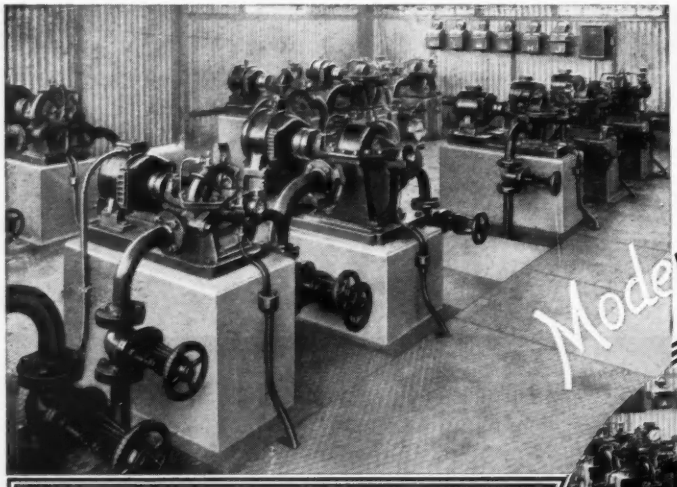

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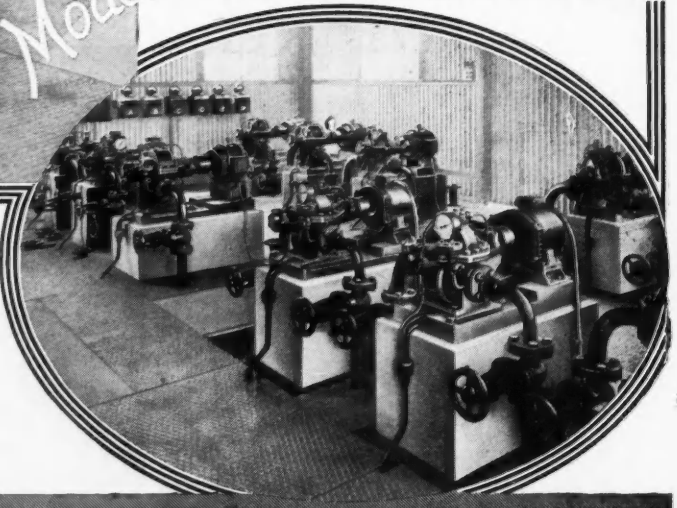

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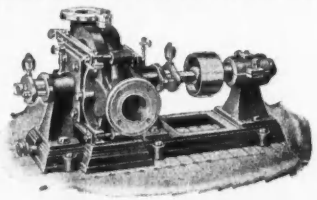

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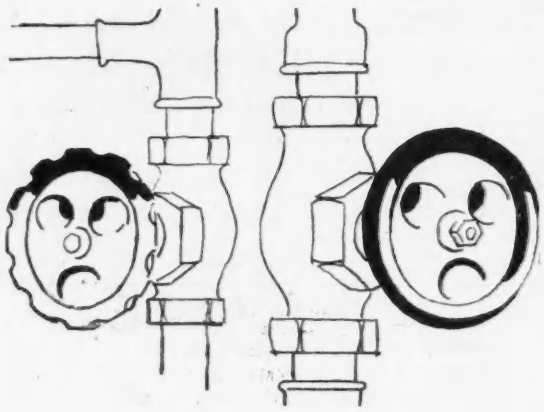

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